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566.43395X00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: K. HONDA, et al

Serial No.: 10/749,411

Filed: January 2, 2004

For: VIRTUALIZATION CONTROLLER, ACCESS PATH CONTROL
METHOD AND COMPUTER SYSTEM

**RENEWED REQUEST FOR RECONSIDERATION OF PETITION TO MAKE
SPECIAL UNDER 37 CFR §1.102(MPEP §708.02)**

MS Petition

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

July 27, 2005

Sir:

Applicants hereby renews its Petition to make this application **Special** previously submitted on March 11, 2005, in accordance with 37 CFR §1.102(d) and MPEP 708.02, VIII. The March 11, 2005 Petition was denied by a Decision issued on June 2, 2005 in which the Petitions Examiner stated that the March 11, 2005 Petition failed to recite distinct features of the claimed subject matter. The present Request for Reconsideration of Petition incorporates by reference the March 11, 2005 Petition and provides additional details regarding the claims and how the claimed subject matter is patentable over the references. The present invention is a new application filed in the United States Patent and Trademark Office on January 2, 2004 and as such has not received any examination by the Examiner.

(A) This Petition is accompanied by the fee set forth in 37 CFR §1.17(h).

The Commissioner is hereby authorized to charge any additional payment due, or to credit any overpayment, to Deposit Account No. 50-1417.

(B) All claims are directed to a single invention.

If the Office determines that all claims are not directed to a single invention, Applicant will make an election without traverse as a prerequisite to the grant of special status in conformity with established telephone restriction practice.

(C) A pre-examination search has been conducted.

The search was directed towards a storage system. In particular, the search was directed towards a storage system. In particular, the search was directed towards a virtualization controller, an access path control method and a computer system in which at least one storage, at least one host computer and a virtualization controller are connected to each other.

According to the present invention, the virtualization controller, being connected to at least one storage and at least one host computer includes a plurality of ports connected to one or both of the host computer and the storage and at least one storage controller.

Further, according to the present invention, each of the ports and the storage controllers of the virtualization controller includes a virtualization processor which holds corresponding information between first identification information and second identification information, wherein the first identification information is used for the host computer to access a storage area held by the

storage and the second identification information is used for the virtualization controller to identify the storage area. The virtualization processor converts, based on the corresponding information, data having the first identification information received from the host computer into data having the second identification information, transfers the converted data to a storage having the storage area, converts data having the second identification information received from the storage into data having the first identification information and transfers the converted data to the host computer.

The virtualization processor further includes access path management information which registers a first port controlled by the host computer, a second port connected to the storage and the virtualization processor, as an access path for each storage area of the storage. According to the present invention, when a request for changing the access path is received, the access path management information is updated and data send/receive control is carried out between the host and the storage area of the storage by use of a new access path.

The access path control method according to present invention executes a change process of data identification information sent and received between a host computer and a storage and executes a conversion process of the identification information allocated to a storage area and carries out access path switching.

The access path control method detects a start-up timing of the switching process of the virtualization processor allocated with respect to each storage area held by the storage, monitors a processing status of an access requested

issued to the storage area which is a target for the switching process or the virtualization processor, temporarily queues the access request to the storage area which is a target for the switching process, newly received from the host computer, when incomplete access request exist, or which issues an instruction for changing the virtualization processor, to each of the modules which constitutes the virtualization controller and relate to the switching process of the virtualization processor when the incomplete access request does not exist, and issues the access request thus queued to a new virtualization processor, at timing when a completion report as the instruction for changing the virtualization processor is received.

The computer system according to the present invention includes at least one storage, at least one host computer and a virtualization controller. The virtualization controller included in the computer system has features the same or similar to that of the virtualization controller described above.

The search of the above features was conducted in the following areas:

| <u>Class</u> | <u>Subclasses</u> |
|--------------|------------------------------|
| 711 | 112, 114, 158, 162, 165, 202 |

Additionally, a computer database search was conducted on the USPTO systems EAST and WEST.

(D) The following is a list of the references deemed most closely related to the subject matter encompassed by the claims:

| <u>U.S. Patent Application Publication No.</u> | <u>Inventor(s)</u> |
|--|---------------------|
| 2003/0188114 | Lubbers et al |
| 2004/0034751 | Horn et al |
| 2004/0103264 | Honda et al |
| 2004/0260861 | Serizawa |
| 2005/0005062 | Liu et al |
| <u>Foreign Patent Application</u> | <u>Inventor</u> |
| JP 40-3127157 | Watanabe |

A copy of each of these references (as well as other references uncovered during the search) was submitted with the March 11, 2005 IDS.

(E) It is submitted that the present invention is patentable over the references for the following reasons.

It is submitted that the cited references, whether taken individually or in combination with each other, fail to teach or suggest the invention as claimed. In particular, the cited references, at a minimum, fail to teach or suggest as recited in the claims:

a first feature of the present invention as recited in independent claims 1 and 8 wherein a virtualization processor holds corresponding information between first identification information and second identification information, the first identification information being used for the host computer to access a storage area by the storage and the second identification information being used for the virtualization controller to identify the storage area, converts (based on the

corresponding information as per claim 8) data having the first identification information received from the host computer into data having the second identification information, transfers the converted the data to a storage having the storage area, converts data having the second identification information received from the storage into data having the first identification information and transfers the converted data into the host computer; and

a second feature of the present invention as recited in independent claim 7 of temporarily queuing the access request to the storage area which is a target for the switching process, newly received from the host computer, when incomplete access request exists, or which issues an instruction for changing the virtualization processor, to each of the modules which constitute the virtualization controller and relate to the switching process or the virtualization processor, when the incomplete access request does not exist.

Further, the cited references fails to teach or suggest the above noted features of the present invention when taken in combination with the other limitations recited in the independent claims.

The references considered most closely related to the claimed invention are briefly discussed below:

Lubbers (U.S. Patent Application Publication No. 2003/0188114) shows data replication with virtualized volumes. The system has a data replication controller for managing replication of in a storage area network. The data replication controller includes: a data processor system configured to implement software processes; a pool of virtualized storage accessible through the data

processor system; processes executing in the processor to enable the data replication controller to couple to an external communication network; processes executing in the processor for designating a virtual disk as a source virtual disk; and processes executing in the processor to enable the data replication controller to cause a second data replication controller to create a destination virtual disk. (See, e.g., Abstract, FIGS. 1-6, and paragraphs [0013], [0021], [0032]-[0034], and [0045]-[0052]).

However, Lubbers does not teach or suggest the use of a virtualization processor that includes access path management information as in the present invention as recited in the claims. Particularly, Lubbers does not teach or suggest a virtualization controller which can select an optimal access path and performs switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage, without carrying out a data migration process between the storages as in the present invention as recited in the claims.

More particularly, Lubbers at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further does not teach or suggest these features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Horn (U.S. Patent Application Publication No. U.S. 2004/0034751) shows asymmetrical load balancing in a networked storage system that includes

several storage volumes and a networked storage system controller/virtualizer. The networked storage system controller/virtualizer further includes a first transaction processor and, optionally, a second transaction processor. In one networked storage system controller/virtualizer implementation, the transaction processors may use one of a plurality of available paths to communicate to a number of storage volumes in the storage system. The networked storage system controller/virtualizer acquires real-time knowledge of the path and storage volume workload. The hardware-accelerated transaction processor performs a cost function calculation in real-time on a per-command basis in order to continually determine the optimal storage volume to access and optimum path routing. The cost function is calculated considering the number of outstanding commands, the number of pending commands, and the size of commands, in order to continually balance the load of command traffic across the storage system. (See, e.g., Abstract, FIGS. 1-3, and paragraph [0008], [0013]-[0015], and [0018]-[0021]).

However, Horn does not teach or suggest the use of the first identification information for a host computer to access a storage area and the second identification information for a virtualization controller to identify a storage area as in the present invention as recited in the claims. Particularly, Horn does not teach or suggest a virtualization controller which can select an optimal access path and performs switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage, without carrying out a data migration process between the storages as in the present invention as

recited in the claims.

More particularly, Horn at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further does not teach or suggest the features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Honda (U.S. Patent Application Publication No. U.S. 2004/0103261) shows a virtualization controller for controlling data transfer between a host system and a plurality of storage devices. The system includes a plurality of first ports for connection with the plurality of storage devices, each of which has a storage area to store data. A second port is included for connection with the host system. Also included are a processor and a memory configured to store volume mapping information which correlates first identification information used by the host system to access a first storage area in one of the storage devices, with second identification information for identifying the first storage area. The correlation is used by the processor to access the first storage area. When data stored in the first storage area is transferred to a second storage area in one of the storage devices, the processor correlates the first identification information with a third identification information for identifying the second storage area, and registers the first identification information and the third identification information in the volume mapping information. (See, e.g., Abstract, FIGS. 1-30, and paragraphs [0007]-[0012], [0176], and [0219]-[0227]).

However, Honda does not teach or suggest a virtualization processor that converts data having a first identification information received from a host computer into data having a second identification information, transfers the data to a storage having a storage area, as well as receiving data from the storage area and converting the data into the data having the first identification information, and sending it to the host computer as in the present invention as recited in the claims. Particularly, Honda does not teach or suggest a virtualization controller which can select an optimal access path and performs switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage, without carrying out a data migration process between the storages as in the present invention as recited in the claims.

More particularly, Honda at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further does not teach or suggest these features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Serizawa (U.S. Patent Application Publication No 2004/0260861) shows a method for allocating a storage area to a virtual volume. The system includes a plurality of storage systems, each of which has a controller and a disk, and a virtualization apparatus coupled to the plurality of storage systems. The virtualization apparatus includes an input port to be coupled to a computer, an

output port to be coupled to the storage systems, a transfer unit which transfers data between an input port and an output port, a control unit, and an access conversion table that records a matching relationship between a virtual volume that is a target of an access request from a computer and storage areas of the plurality of storage systems that are allocated to the virtual volume. The control unit, upon receiving a write request issued by the computer to the virtual volume, allocates a storage area of the plurality of storage systems to the virtual volume, and updates the access conversion table. The virtualization apparatus notifies the computer, according to a request from the computer, of virtual volume identification information to identify the virtual volume and the size of the virtual volume. (See, e.g., Abstract, FIGS. 1-10, and paragraphs [0005]-[0009], and [0024]-[0040]).

However, Serizawa does not teach or suggest the use of a virtualization processor that includes access path management information as in the present invention as recited in the claims. Particularly, Serizawa does not teach or suggest a virtualization controller which can select an optimal access path and performs switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage, without carrying out a data migration process between the storages as in the present invention as recited in the claims.

More particularly, Serizawa at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention

as recited in independent claim 7, and further does not teach or suggest these features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Liu (U.S. Patent Application Publication No. 2005/0005062) shows a redundant external storage virtualization computer system. The system includes a host entity for issuing an I/O request, a redundant storage virtualization controller pair coupled to the host entity for performing an I/O operation in response to the I/O request issued by the host entity, and a plurality of physical storage devices for providing storage to the computer system. Each of the physical storage devices are coupled to the redundant storage virtualization controller pair through a point-to-point serial-signal interconnect. The redundant storage virtualization controller pair includes a first and second storage virtualization controller coupled to the host entity. In the redundant storage virtualization controller pair, when the first storage virtualization controller is not on line or not in operation, the second storage virtualization controller will take over the functionality originally performed by the first storage virtualization controller. (See, e.g., Abstract, FIGS. 1-45, and paragraphs [0023]-[0026], and [0073]-[0079]).

However, Liu does not teach or suggest the use of a virtualization processor including access path management information, as well as the use of the first identification information for host computer to access a storage area, and the second identification information for the virtualization controller to identify a storage area as in the present invention as recited in the claims. Particularly, Liu

does not teach or suggest a virtualization controller which can select an optimal access path and perform switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage without carrying out a data migration process between the storages as in the present invention as recited in the claims.

More particularly, Liu at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further does not teach or suggest these features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Watanabe (JP403127157 A) shows a load balancing control system for a storage device to prove the availability of the storage device by storing an access sequence, an execution frequency, and an access waiting frequency, defining the execution priority of an access request, and optimizing an execution sequence of the access request from plural access paths. (See, Abstract).

However, Watanabe does not teach or suggest the use of a virtualization controller connected to storages and host computers including a virtualization processor as in the present invention as recited in the claims. Particularly, Watanabe does not teach or suggest a virtualization controller which can select an optimal access path and perform switching to the optimal access path out of a plurality of access paths, which connects between a host computer and a storage,

without carrying out a data migration process between the storages as in the present invention as recited in the claims.

More particularly, Watanabe at a minimum does not teach or suggest the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further does not teach or suggest these features of the present invention when taken in combination with the other limitations recited in each of the independent claims.

Therefore, since the cited references fail to teach or the above described first feature of the present invention as recited in independent claims 1 and 8, and the above described second feature of the present invention as recited in independent claim 7, and further fail to teach or suggest these features of the present invention in combination with the other limitations recited in each of the independent claims, it is submitted that all of the claims are patentable over the cited references whether said references are taken individually or in combination with each other.

(F) Conclusion

Applicant has conducted what it believes to be a reasonable search, but makes no representation that "better" or more relevant prior art does not exist. The United States Patent and Trademark Office is urged to conduct its own complete search of the prior art, and to thoroughly examine this application in view of the prior art cited herein and any other prior art that the United States Patent and Trademark Office may locate in its own independent search. Further,

while Applicant has identified in good faith certain portions of each of the references listed herein in order to provide the requisite detailed discussion of how the claimed subject matter is patentable over the references, the United States Patent and Trademark Office should not limit its review to the identified portions but rather, is urged to review and consider the entirety of each reference, and not to rely solely on the identified portions when examining this application.

In view of the foregoing, Applicant requests that this Petition to Make Special be granted and that the application undergo the accelerated examination procedure set forth in MPEP 708.02 VIII.

Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (566.43395X00).

Respectfully submitted,

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